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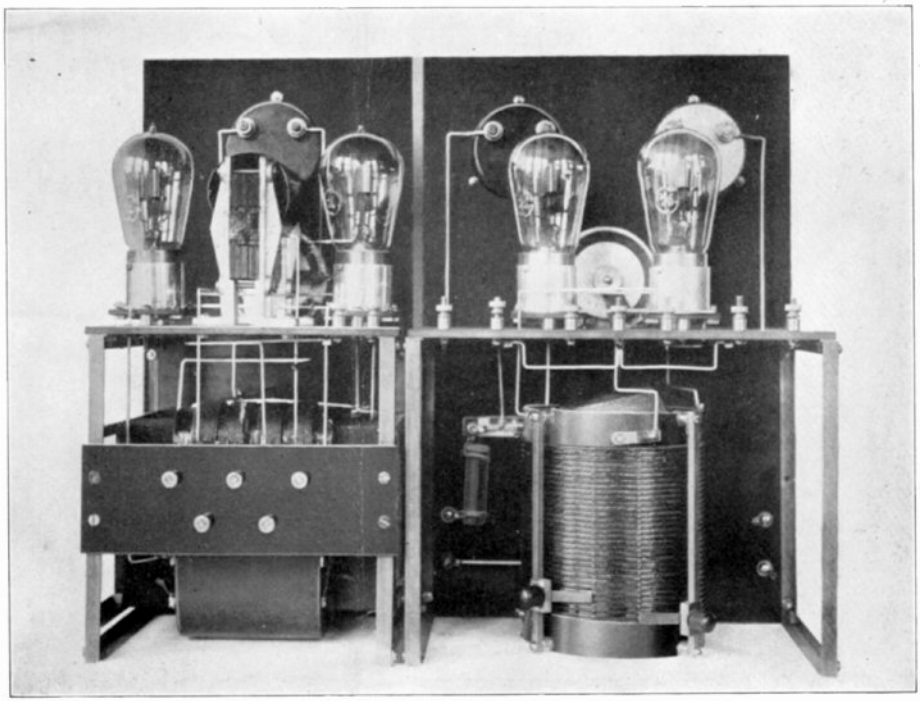


Fig. 1. The rectifier unit and the transmitting set previously described

IN THIS ISSUE

Operating Transmitting Tubes From 110-Volt, 60 Cycle A. C.

This unit supplies the plates and filaments of 1 to 4 5-watt tubes. It is designed especially for the transmitter previously described.

By W. H. Bullock

Rectifier or Generator

IN point of cost, at least, the high voltage D. C. supply for vacuum tube transmitters has not reached a satisfactory solution. There are now generators, electrolytic rectifiers, and tube rectifiers. Generators are expensive, awkward, noisy, and troublesome. Electrolytic rectifiers are good if they are good, though they are not pleasant things to handle or entirely dependable.

A vacuum tube rectifying unit is quiet, always on the job, starts quickly, costs less than a motor generator and not much more than the electrolytic type. It provides a compact unit with only one control and is instantly on the job when the circuit is thrown over or transmitting. Considering all the factors it seems to be the most suitable form of high voltage supply, particularly where space is limited. The only additional parts required over the electrolytic rectifier are the vacuum tubes.

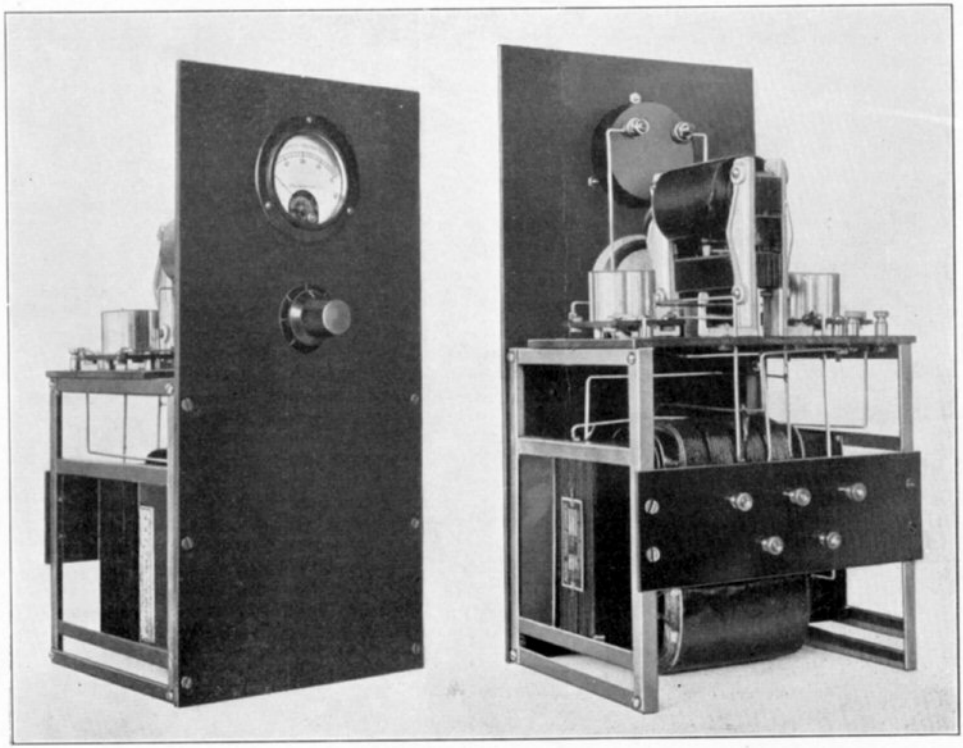


Fig. 2. The finished product, ready to connect to the transmitter. Note the system of supports employed.

The unit described here consists of an Acme 200-watt power transformer giving 500 volts for the plate circuits, 10 volts for the transmitting filaments and 10 volts for the rectifiers. There are taps on the high voltage winding to give 350 volts on the plates also, which can be used if two switches are provided on the front of the panel, although these are not ordinarily required. The full voltage from the secondary is 750 and 550 volts but there is a drop in the rectifier tubes of approximately 200 volts. By

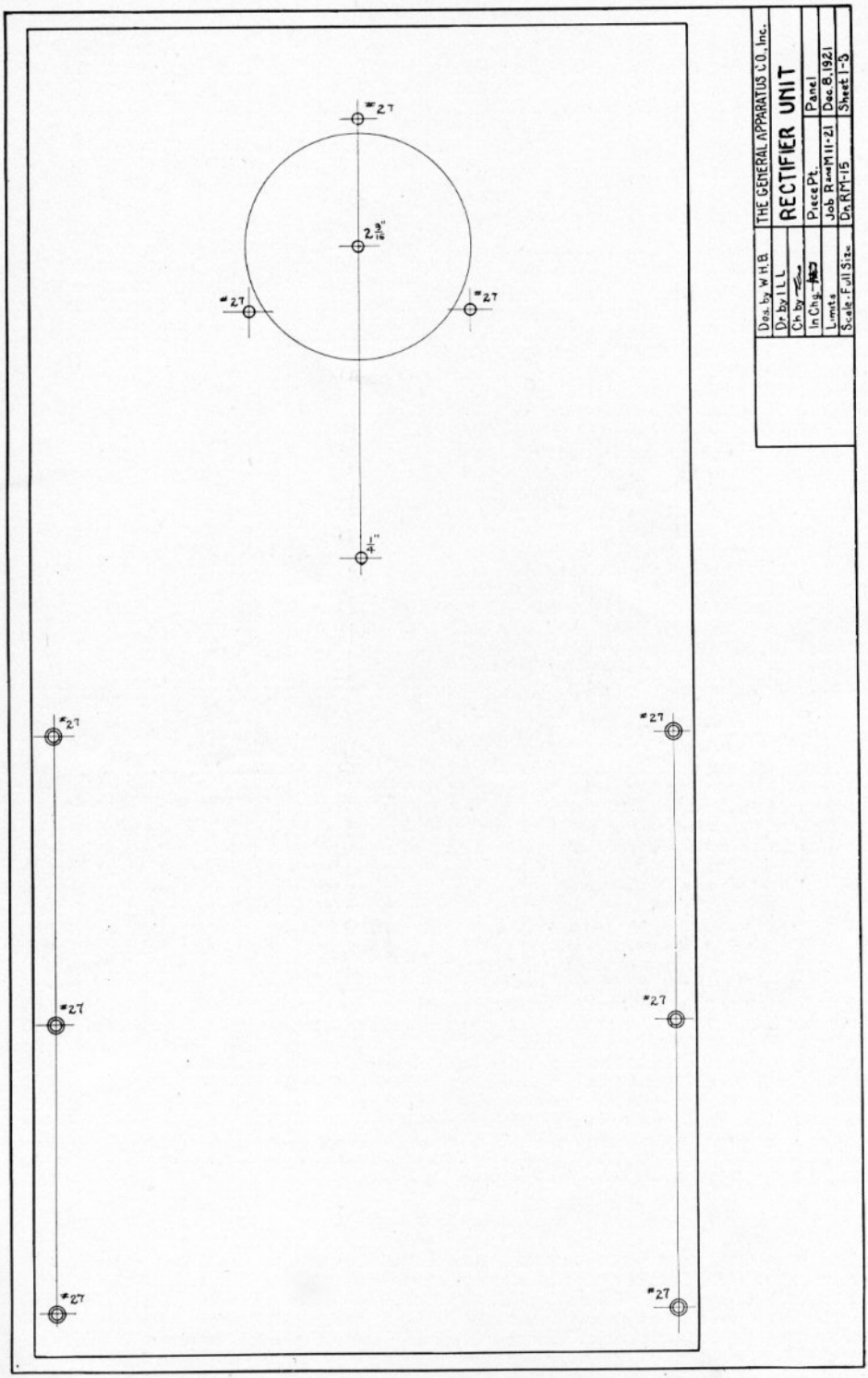


Fig. 3. Scale drawing of the front panel, reduced to one half size.

using two rectifying tubes both halves of the cycle are employed, giving double the power obtained with only one rectifier tube. The choke coil and 1 mfd. condensers smooth out the current sufficiently to make the A. C. hum inaudible.

Panel and Supports

The illustration in Fig. 1 shows the complete transmitting set, with front and rear views of the rectifier unit in Fig. 2. Scale drawings reduced to one-half size are shown in Figs. 3 and 4, giving details of the front panel, tube and binding post panels, and the angle brass supports. The hole in the front panel is for the small size meters but if a Jewel type 74 alternating current meter is employed the hole should be 3 inches in diameter. Standard sizes have been employed for drills to reduce the variety of sizes to a minimum.

The angle brass frame work which supports the three panels also carries the power transformer and 1 mfd. smoothing condensers. The top and bottom angle brass strips are bolted to the vertical ones, but the intermediate strips which hold the transformer are soldered in place. It will be noted that short sections of angle brass are soldered to the transformer supports to hold the core securely in place. It is advisable to solder the outside corners in addition to bolting them for a heavy load is carried on the frames. The condenser cases are scraped and soldered to the brass strips. This should be done carefully so as not to apply excessive heat to the condensers.

Assembly and Wiring

With the parts cut out as shown by the drawings the meter and rheostat should be put on the front panel, the frames completely assembled, and the transformer with the frames put on the front panel. Then come the condensers, sockets and choke coil. All wiring possible should be done before the back connection panel is put in place so as to leave the transformer leads accessible. A diagram is given to illustrate the exact appearance of the wiring as it is put on, looking at the set from the rear. The connection panel goes on last when the finishing touches are to be made. No connections for the rectifying tube voltmeter are shown in the drawing but the meter should be put directly across the filament leads. A Shramco rheostat was used on the original set although the G. A.-Fada 5-ampere rheostat may be preferred by some experimenters. It has the advantage of being smaller and lower in price. If the latter is used a 3/16 inch hole is needed in the panel with a countersunk No. 27 hole ½ in. below, center to center.

Using the Rectifier

Although this unit can be used with any vacuum tube transmitter, it is designed particularly for the outfit previously described. When the two are set up as in Fig. 1, the high voltage terminals on the tube panel should be connected to the corresponding positive and negative terminals on the transmitter. The three binding posts, marked F, Trans, GND, and F should be joined. The two lower binding posts at the rear are for the 110-volt, 60-cycle A. C. supply. A fused switch must be inserted in the supply line or an equivalent arrangement in the antenna switch. To transmit, the rectifier tubes should be adjusted by means of the rheostat until a reading of 7½

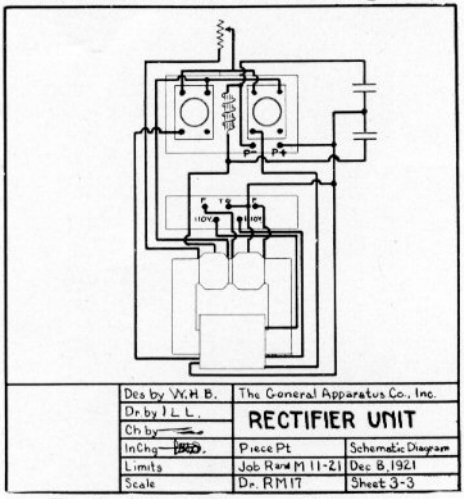


Fig. 5. Circuit of the rectifying unit.

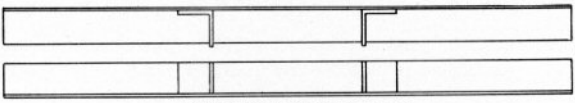
volts is obtained. Then the transmitting tubes should be lighted until, by running up the rheostat, a current of 40 milliamperes for each tube is obtained. Instructions for operating and adjusting the transmitter itself have been given already.

Transmitting Range

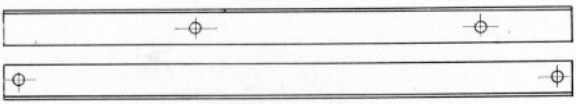
So many new records are being made with tube transmitters that it is difficult to approximate with any degree of accuracy the range which can be covered with an outfit of this sort. It is safe to say, however, that on straight undamped waves transmission, for which the set was primarily designed, distances of 100 miles can be covered regularly and on good nights with a skilful operator at the sending station and a regenerative receiver at the other end several hundred miles can be reached without difficulty.

NOTICE TO READERS

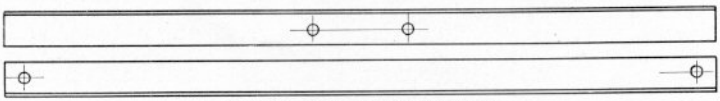
Because the back numbers of RADIO AND MODEL ENGINEERING, up to and including the November issue, have become entirely exhausted, the material contained in them, with some new matter, will be reprinted in book form under the title of Design of Modern Radio Receivers. Experimenters will find the various designs shown, running from simple sets to regenerative short wave outfits and long wave receivers, of much assistance in practical constructional work. Dealers are already placing their orders for delivery on February 15, 1922. The price is $.50 per copy.



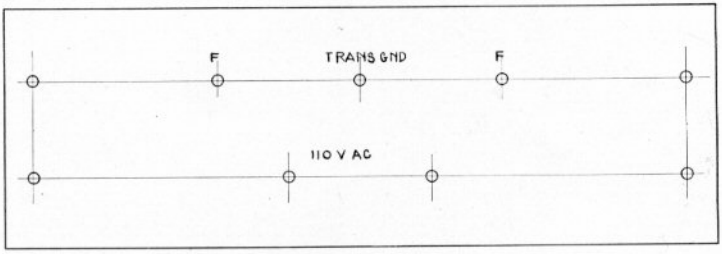
TRANSFORMER SUPPORTS - Make 4



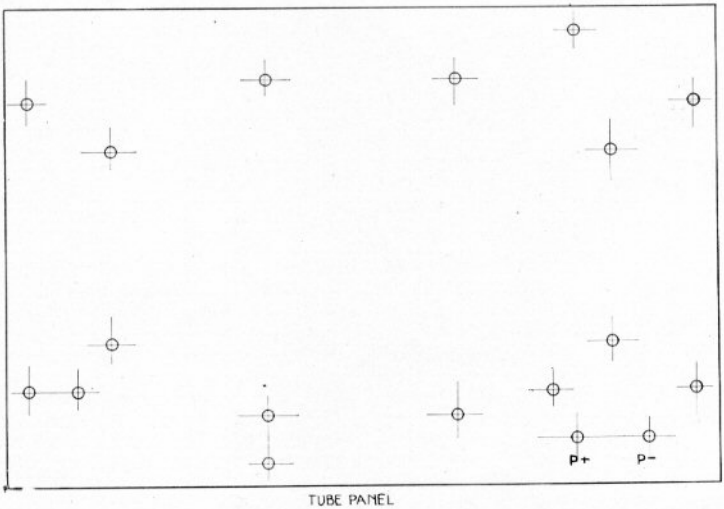
HORIZONTAL PANEL SUPPORTS - Make 4



VERTICAL PANEL SUPPORTS - Make 4



REAR CONNECTION PANEL



TUBE PANEL

	Des by W.H.B.	THE GENERAL APPARATUS CO. Inc.	
	Dr. by I.L.L.	RECTIFIER UNIT	
	Ch. by		
	In Chg.	Piece Pt.	Details
	Limits	Job R and M 11-21	Dec 8, 1921
	Scale: Full Size	Dr. RM 16	Sheet 2-3

Fig. 4. Additional details, one half size.

150 to 600 Meter Regenerative Set

The condenser-tuned secondary in this receiver has the advantage of a larger wavelength range than can be obtained with a grid variometer.

By M. B. Sleeper

Use of This Set

THERE are now many users of short wave regenerative receivers beside the regular radio experimenters, for those who buy crystal sets for broadcast reception soon recognize the short-comings of those outfits, and find the need of a receiver that will cut out interference as well as bring in signals with greater strength.

For long distance or broadcast reception this outfit comes well recommended, for excellent results have been obtained on 200 and 360 meters. With two steps of amplification, when copying Newark at the G. A. laboratory, a pair of Murdock receivers were overloaded so that the entire casing vibrated from the movement of the diaphragm. Dealers and experimenters who make up apparatus to sell will find this set sure and dependable, one on which they can guarantee maximum results. A few simple instructions are required, however, before the set is put in the hands of a beginner because of the extreme sharpness of the tuning. In practice, the least amount that the secondary condenser can be moved will bring phone signals in or out. Of special advantage is the shielding obtained by using the new german silver dials. One of the new Federal plugs, which takes the phone tips, is illustrated.

The Circuits Used

In this receiver there is an antenna inductance, controlled by small and large step switches, to which is coupled a ball carrying the entire secondary inductance. Only the variable condenser is used to tune the secondary circuit. The plate variometer gives the tuning necessary to make the set regenerate or oscillate. A detector is provided in this outfit, to which an amplifier can be attached by the binding posts on the right. When the detector only is in use, phones are plugged in at the jack.

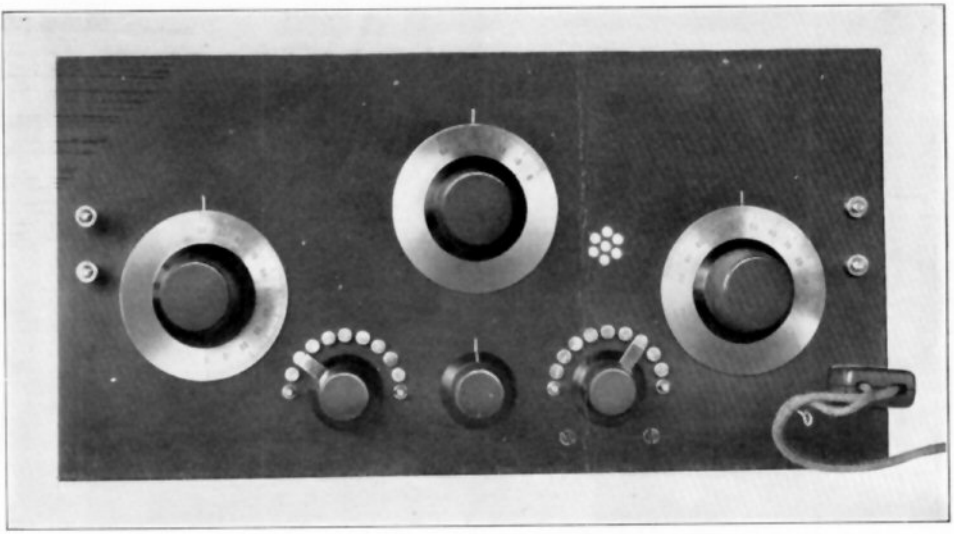


Fig. 1. In appearance and operation, a first class receiver

Some experimenters will exclaim over the use of what appears to be a large capacity in the secondary, as compared with the variometer tuned circuit. Actually, however, a very small capacity is employed at the 200-meter setting, and the distributed capacity is low. With a variometer there is a comparatively high distributed capacity, not only between the windings of the variometer but in the shellac or varnish used. No grid variometer will tune over a range of more than 150 to 350 meters. For longer wavelengths the common practice is to shunt the secondary circuit with mica

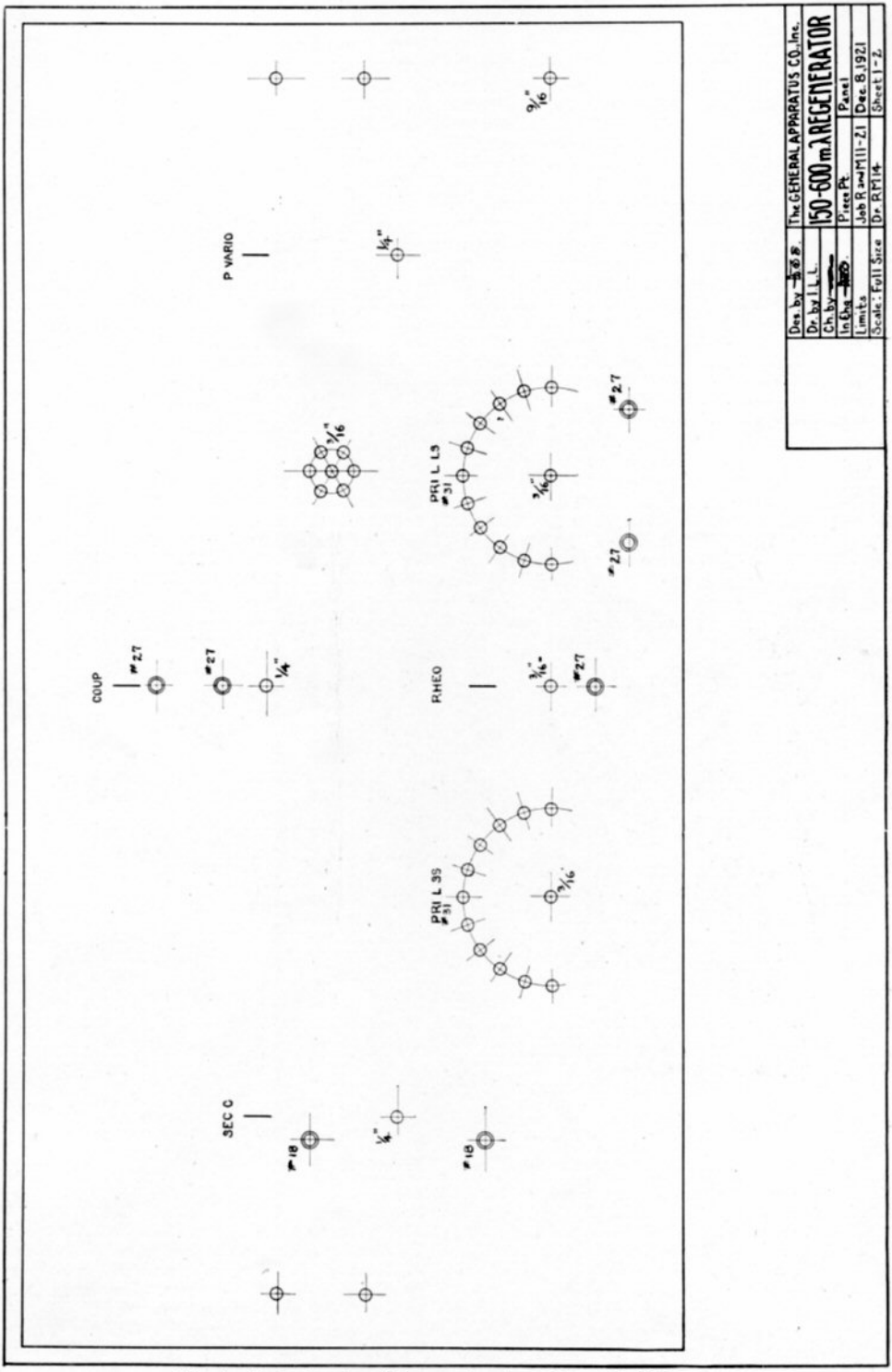


Fig. 4. Scale drawing of the panel, reduced to one half size

condensers, bringing a heavy capacity into the circuit just the same.

Details of Construction. There is very little hand work to be done on the set, and what must be done is quite elementary, giving the experimenter the advantage of a splendid outfit at a small cost. The list of parts is helpful in getting together the material required. Fig. 4 gives a one-half scale drawing of the front panel, of L. P. F., 7½ by 15 by 3/16 in. Dimensions can be determined by the simple method of setting the dividers on the drawing and doubling the distances. Countersunk holes are shown by two circles.

The primary inductance is wound on an L.P.F. tube 3½ ins. outside diameter and 5 ins. long, with a ⅜-in. wall. The first No. 27 hole for the coil mounting pillar is ¼ in. from the end of the tube, the second ¾ in. below, and the ¼ in. hole for the shaft another ½ in. down. The winding, of No. 20 D. C. C. wire, B. and S. gauge, starts ¼ in. from the center of the shaft hole. Taps are taken off at the left, for the small steps switch, at 0, 1, 2, 3, 4, 5, 6, 7, and 8, and on the right, for the large steps switch, at 9, 18, 27, 36, 45, 54, 63, 72, and 81 turns.

Taps can be made by winding extra turns, as has been explained in previous articles, or by the other side on the other outside hole, and both brought out through the center hole. Tap wires are less liable to break when taken off in this way.

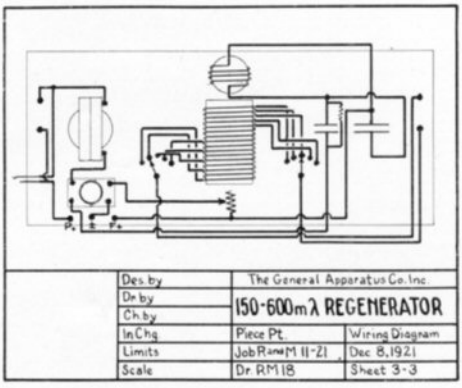


Fig. 3. Connections for the set

One side of the tap is cut off short, and soldered to the other, to make a single wire lead.

The secondary ball is of the 3-in. standard size, of mahogany, wound full with one layer of No. 20 D. C. C. wire, B. and S. gauge. A split

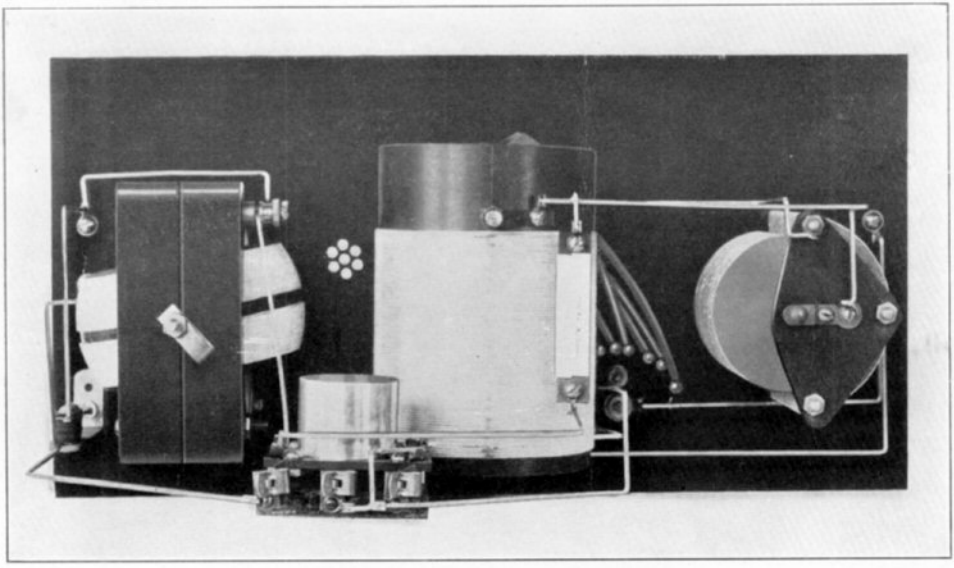


Fig. 2. Rear view, showing constructional features

three-hole method. This is more satisfactory for heavy wire. Before the tube is wound, a set of three holes, the holes of a set spaced 3/16 in. apart, is made for each tap. The sets of holes should be staggered, and spaced down the tube on the basis of 24 turns per inch. One side of the tap is put in one outside hole, the shaft serves as the terminals for the coil. Phosphor bronze springs, fastened by ¼-in. 6-32 screws to the tube at one end, and bear on the shaft to make contact. Lugs are fitted to the screws to take the connections.

A wooden panel 6 by 2½ by 3/8 ins. carries the socket and battery terminals. This is

fastened to the front panel by 1-in. 6-32 F. H. screws. Two 3/8-in. holes are drilled in the base and 6-32 nuts put in for the screws.

Since no mounting device is provided for the Tuska variometer, four No. 27 holes are drilled and threaded 8-32 to take ½-in. 8-32 F. H. screws through the panel. They must be laid out carefully with a scriber and square.

Assembly of the Parts. With the panel drilled, the coupler completed and the coil mounting pillars in place, the variometer drilled, and the tube base ready, the work of assembly begins. The switches and points are mounted, the switch points tinned and cleaned from paste, binding posts, tube base, rheostat, jack, and variometer put in place. Lugs should be put on the rheostat screws, also. It should be placed so that the screws will be toward the condenser end.

Finally, the coupler goes on the panel and the leads are soldered. Fig. 3 gives a diagram. It will be noticed that on both switches and dial controls clockwise rotation gives an increase, in accordance with approved practice.

Operation of the Receiver The proper use of the tuning controls must be learned through experience with the set, for the adjustments are so critical that, if not handled properly, the set will not produce maximum results. Adjustments should be made on the primary first, then the secondary condenser, the plate variometer, and, finally a slight regulation of the rheostat. Usually the secondary coupling is at zero.

If an amplifier is employed, make sure that a 0.001 mfd. phone condenser is connected across the primary of the first amplifying transformer. Do not expect good results with dry cells for filament lighting. Use a storage battery of 6 volts, 40 or 60 ampere-hours capacity.

Some Common Radio Problems

Troubles and questions that radio experimenters encounter.

By B. H. Ross

The Set That Won't Oscillate EVERY day experimenters write to the G. A. about things that won't work, often questions that are hard to answer even broadly because of lack of details given, but there are a few common ones which occur so often that it may be worth while to take a little space to discuss them.

The usual report is that a regenerative receiver doesn't regenerate or oscillate. In most cases the audion filament is supplied by dry cells. A Radiotron UV200 or 201 will not work on dry batteries unless there are at least two sets of five cells, with the cells of a set wired in series and the two sets put in parallel. At least two sets must be used for each tube.

When a circuit is oscillating the losses in the grid are supplied from the plate by the feedback coupling. Unless the filament is burning brightly, a UV200 takes practically the full 6 volts from a storage battery, the flow of current in the plate circuit is not great enough to supply the grid losses. Hence no oscillations. The plate circuit acts as a hammer hitting a pendulum just hard enough to keep it swinging steadily.

Of course there are Radiotrons which are not good oscillators, but in general they are thoroughly reliable. Remarks concerning the Radiotron apply equally to Cunningham tubes. As for other makes, some experimenters like them and some do not. The easiest way to settle the tube problem is to try it in another set which is working.

Very few tubes or circuits will oscillate when connected to an amplifier unless a condenser of 0.001 mfd. or more is connected across the primary of the first amplifying transformer.

Another thing—a UV200 tube should have 22.5 volts on the plate and 45 volts on the UV201. Voltages up to 110 can be applied to the latter type, however, when great amplification is required.

A variable gridleak or variable grid condenser is not needed for regeneration. Experimenters who have them, however, consider them necessary, not realizing that the adjustments obtained run to higher and to lower values than should be used. When the adjustments are properly set they will be found to be of about 1 megohm and 0.0005 mfd., the correct values for the gridleak and grid condenser.

Radio Phone Reception A great many electrical stores are now selling radio receiving sets, and some of the statements made by uninformed clerks would be amusing if they did not cause so much trouble for the novice who is earnestly trying to put up a set to receive the telephone broadcasts. I have heard clerks glibly assure customers, for example, that a crystal receiver will bring in speech and music clearly at a distance of 100 miles. It won't and doesn't. A crystal set will not give clear speech from the stations now transmitting when more than 10 miles away. On a good non-regenerative audion set readable speech can be heard over 50 miles, and 75 to 100 miles on a regenerative receiver.

This is taking average results. As a matter of fact, Mr. L. M. Clement has received reports on the Western Electric ½ K.W. phone station at New York from very nearly every State in the Union. Reception on a loud speaker was possible in California, but that cannot be done at every receiving station or from any other transmitting station now operating. The wavelength ordinarily used by that station is 450 meters.

Reception on Loud Speakers

Frequently a man buys a Vocaloud or similar loud speaker and complains that, altho the signals are clear in the telephones, he cannot hear them two feet from the loud speaker. Of course not. Signals must be very strong in the phones before a Vocaloud can be heard in a large room. One to three amplifiers, with, preferably, three 45-volt plate batteries on the last tube should be employed. Then the Vocaloud will make plenty of noise. These instruments are not meant to do the work of amplifiers.

Some Patent Queries

Then there are the questions about patents. Experimenters sometimes get the idea that they want to build and sell radio instruments, or regenerative receivers with one connection left off. Radio equipment and circuits are bound up in a net work of patents, some of which have been defended and some have not. The safest course for a man who is not fully informed as to conditions now existing and the changes that are constantly taking place is to take no chances, for he will not find the possible gain worth the risk involved. Neither is it safe to side-step responsibility by leaving out a connection or to employ similar methods. In the last six months many companies have been brought to account. In this connection it may be mentioned that suit has been brought against the Radio Service Company of Lynbrook, Long Island, for infringement of patents covering the familiar G. A. grid, phone, and gridleak condensers, though action is not taken in such cases frequently because the infringers are found to lack financial responsibility and have no assets against which claims can be made.

STANDARDIZED PARTS FOR THE POWER SUPPLY UNIT.

1—GA-STD-8P L.P.F. panel 15x7 ½x3/16	(1½ lb.)	$2.97
1—GA-STD-6P L.P.F. panel 7½x5x3/16 in.	(½ lb.)	.99
1—GA-STD-11P L.P.F. panel 10x2½x⅛ in.	(4 oz.)	.45
8—12-in. lengths ⅜-in. angle brass	(4 lb.)	1.60
2—pkg. of 10 nickeled screws ½-in. 6-32 F.H.	(2 oz.)	.24
1—pkg. of 10 nickeled screws ½-in. 6-32 R. H.	(1 oz.)	.12
1—pkg. of 10 nickeled screws ¼-in. 6-32 R. H.	(1 oz.)	.11
3—pkg. of 10 nickeled nuts 6-32	(3 oz.)	.24
1—pkg. of 10 nickeled screws 1-in. 8-32 R. H.	(3 oz.)	.16
1—pkg. of 10 nickeled screws ½-in. 4-36 R. H.	(1 oz.)	.11
1—pkg. of 10 nickeled nuts 4-36	(1 oz.)	.08
1—pkg. of 10 nickeled nuts 8-32	(2 oz.)	.09
6—2 ft. lengths square tinned copper wire	(3 oz.)	.36
1—5-ampere GA-Fada rheostat	(5 oz.)	1.50
1—15-volt jewel A.C. voltmeter	(2 lb.)	8.00
2—21AA 1 mfd. condensers	(2 lb.)	5.50
1—200-watt Acme power transformer	(15 lb.)	16.00
2—GA-STD-A1 socket	(10 oz.)	1.60
7—GA-STD-A10 binding posts	(10 oz.)	.70
1—½-amp. Acme choke 1½ henries	(3 lb.)	6.00
2—Kenotron rectifier tubes UV216	(2 lb.)	15.00
COMPLETE SET OF PARTS FOR POWER UNIT As listed above ready to assemble	(40 lb.)	$59.87

SEMI-FINISHED PARTS

Front panel drilled	$ .97
Tube panel drilled	.60
Rear panel drilled	.50
Complete supporting frames nickeled	2.75

COMPLETE POWER UNIT READY TO OPERATE As illustrated (40 lb.) $78.90

STANDARDIZED PARTS FOR THE 150- TO 600-METER REGENERATIVE RECEIVER.

1—GA-STD-8P L.P.F. panel 15x7 ½x3/16 in.	(1½ lb.)	$2.97
1—12-in. length ¼-in. brass rod	(7 oz.)	.15
1—Wooden base 6x2½x⅜ in.	(5 oz.)	.20
2—GA-STD-A7 100 division dial and knob ¼ in. hole	(1¼ lb.)	2.50
1—GA-STD-A8 50 division dial and knob ¼ in. hole	(9 oz.)	1.25
2—GA-STD-A9 1-in. radius switch	(10 oz.)	$1.30
1—G.A.-Fada rheostat	(6 oz.)	1.15
18—GA-STD-A13 switch points	(2 oz.)	.72
4—GA-STD-A10 binding posts	(10 oz.)	.40
1—Federal open circuit jack	(6 oz.)	.70
2—2 ft. lengths Empire tubing	(2 oz.)	.80
1—pkg. of 20 small soldering lugs	(2 oz.)	.25
2—coil mounting pillars	(3 oz.)	.16
1—pkg. of 20 No. 6 nickeled washers	(1 oz.)	.04
1—pkg. of 10 ½-in. -832 F. H. nickeled screws	(2 oz.)	.14
1—pkg. of 10 1-in. 6-32 F. H. nickeled screws	(2 oz.)	.14
3—Special Fahnestock binding posts	(1 oz.)	.12
1—GA-STD-A4 grid leak condenser	(2 oz.)	.50
2—rotor shaft contact spring	(1 oz.)	.08
2—Fibre rotor spacing washers	(1 oz.)	.08
1—pkg. of 10 ¼-in. 6-32 R. H. nickeled screws	(3 oz.)	.11
½—lb. No. 20 D. C. C. wire	(8 oz.)	.80
1—GA-STD-A1 audion socket	(5 oz.)	.80
1—pkg. of 10 6-32 nickeled nuts	(2 oz.)	.08
1—GA-STD-11 mahogany coupling ball	(5 oz.)	.90
1—GA-STD-A17 0.0008 mfd. variable condenser	(1 lb.)	4.30
1—Tuska variometer	(2 lb.)	6.25
1—L.P.F. tube 5 in. long 3½ ins. diam. ⅛-in. wall	(6 oz.)	1.48
4—2 ft. lengths square tinned copper wire	(2 oz.)	.24
4—stopping points	(2 oz.)	.20
COMPLETE SET OF PARTS FOR RECEIVER. As listed above ready to assemble	(10 lb.)	$27.97

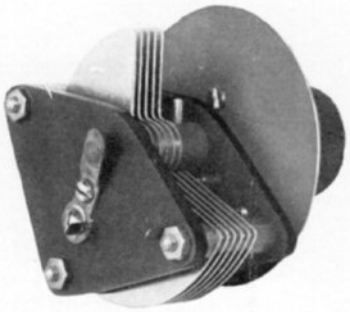
SEMI-FINISHED PARTS.

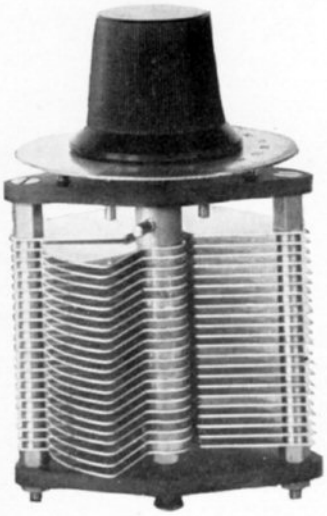
Panel drilled extra		1.10
Engraving per letter		.09
Varicoupler wound and assembled	(2 lb.)	5.67
Panel drilled with condenser rheostat wooden base and variometer mounted ready to complete	(8 lb.)	24.64
Parts to complete the semi-finished above	(2 lb.)	9.85

AUXILIARY PARTS

GA-STD-A6 laboratory type amplifier control	(2 lb.)	$13.95
UV-200 radiotron detector tube	(8 oz.)	5.00
UV-210 radiotron amplifier tube	(8 oz.)	6.50
Murdock 56 2,000-ohm phones	(1½ lb.)	5.00
Baldwin type C phones	(2 lb.)	13.75
Vocaloud station type	(4 lb.)	30.00

AIR CONDENSERS





WHAT do you require of a variable air condenser? Or have you ever stopped to think just what you should require? The following specifications will serve as a guide in judging the merits of a condenser.

Electrical Features: Insulation of such material and design to produce a minimum power factor, high ratio of maximum to minimum capacity, negligible resistance in the leads.

Mechanical Features: Small in size, easy to mount, convenient terminals, permanent construction, smooth bearings, self-retaining movable plates.

Bearing these factors in mind, consider the G. A. condensers illustrated. There is no moulded composition or "mud" employed, but sheet stock which give the extremely low power factor of 0.7%. The capacity ratio on the 0.0025 mfd. condenser is 8 to 1, and on the 0.001 mfd. size 31 to 1 over the useful portion of the scale. Usual types have a ratio of 4 to 1 and 10 to 1 for the two sizes respectively. As for connections, on the stationary plates the resistance is zero, and only 7 milli-ohms on the movable plates.

As for the mechanical construction, the G. A. condensers can be worked in nicely because of their compact design. The end plates are 3½ inches long and 2⅛ inches wide, and the extreme width, with the variable plates out, 3 inches. Mounting screws are 2 inches apart on a line ¼-inch from the shaft center toward the stationary plates. The overall height of the 11-plate condenser, up to the top of the upper end plate, is 1⅞ inches, and on the 43-plate type 3⅜ inches. The ¼ inch shaft protrudes 1 inch above the end plate. The mounting screws, which are threaded into the upper plate, come under the dial and do not show. Terminals in the form of nuts fitted with soldering lugs are located on the bottom panel. As for permanence, you can drop a G.A. condenser, throw it across the room, and give it rough treatment that no other condenser will stand because it has no soft lead supports or flimsy zinc plates. The smooth running steel shaft is copper plated to prevent rusting. In a horizontal position the plates stay put because of the adjustable friction take-up on the bearing. Stops are provided to limit the movement to 180°, though they can be removed if desired.

When you go over these factors thoughtfully you will understand why the G. A. variable condensers are bought by those who want good equipment at reasonable prices.

Prices:

GA-STD-A15 variable condenser, 0.00025 mfd. capacity, without dial, 8 oz.....$3.25

GA-STD-A17 variable condenser, 0.001 mfd. capacity, without dial, 1 lb.....$4.30

GA-STD-A15 condenser with GA-STD-A7 knob and dial, 12 oz.....$4.25

GA-STD-A17 condenser with GA-STD-A7 knob and dial, 1½ lb.....$5.30

CLASS 10-B

GA-STD

G.A. STANDARDIZED EXPERIMENTAL SUPPLIES

THE GENERAL APPARATUS COMPANY, Inc. 570 West 184th Street NEW YORK CITY

1922

Problems which will confront Radio Dealers during the coming year

Growing Interest in Radio

SINCE the opening of broadcasting stations in various parts of the country, the sale of radio equipment has jumped by leaps and bounds. This increase, steadily climbing, has brought many problems to radio manufacturers as well as dealers, because the demands for radio and more radio came so suddenly that, in many quarters, it was thought that wireless was being taken up as a fad which would be dropped as quickly.

The conservative policies of the G. A. prevented us from going into the manufacture of broadcast receivers until such a time as the demand became stabilized, but we watched with interest the effect of the popularizing of radio upon our business of selling staple and standardized radio supplies. Great importance was attached to the results because of the fact that an experimenter is a regular customer, while a "listener" may never make a purchase after he gets his first receiving set.

In the past three months, ending November 30, the sales of G. A. STANDARDIZED SUPPLIES has increased 850% over the average figure for the six winter months of last season, and subscriptions to Radio and Model Engineering 375% over the three preceding months. The significance of these figures is not that the usual winter's sales are being made, but that many listeners are turning experimenters.

Purchases for 1922

The nation-wide day-to-day purchases which have obtained for two years have made it extremely difficult for radio manufacturers to handle the rush orders which now come from every quarter. To meet the situation, we are increasing the factory space at the G. A. by 150%, and the stock storage space 500%. Radio dealers must do their part, too, by ordering supplies in larger quantities. This will not only do away with the "out of stock" reports to customers and the telegraph orders, but secure larger discounts.

G. A. STANDARDIZED SUPPLIES are to the radio dealer like Ivory soap and Shredded Wheat to the grocer, staple supplies for which a demand has been created and maintained, and for which there is a steady year-round need.

G. A. Dealers Sales Promotion

G. A. stock dealers will find a still greater demand for G. A. STANDARDIZED SUPPLIES during 1922. Plans for the year call for extensive magazine advertising in popular magazines as well as the radio publications. Photographic enlargements of illustrations in Radio and Model Engineering are now being supplied without charge, and other dealers' helps will be furnished with the idea of maintaining radio sales right through the summer without permitting the usual summer drop.

Stock and Display Cabinet

Fourteen of the larger radio stores have lined up behind the G. A. dealers' sales promotion plans. An interesting pamphlet will be sent to you, if you request it, about the counter display cabinet which also holds a complete stock of G. A. STANDARDIZED SUPPLIES. The line can be installed in your store at small expense, and you will obtain the advantage of maximum discounts, the privilege of having your name on the order blanks which accompany each copy of Radio and Model Engineering, and preferred service on deliveries.

Come in with the G. A. and take up our slogan—

NO SUMMER SALES DROP FOR 1922